

# Introduction to MISR Data Analysis and Tools



**Brian E. Rheingans**  
Jet Propulsion Laboratory, California Institute of Technology

**Exploring and Using MISR Data**  
**University of Washington**  
**Seattle, WA**  
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# SOM Background

Figure A-3 Sample Partial MISR Swath in SOM vs. Distorted Geographic Lat/Lon

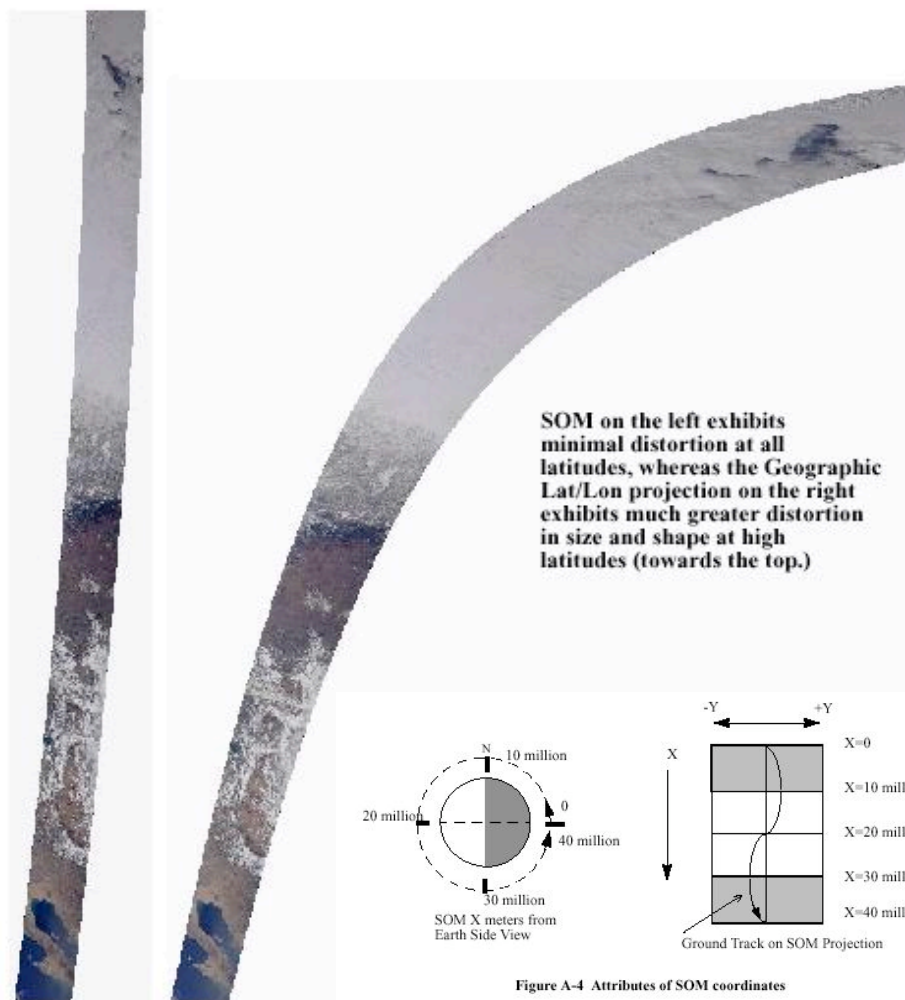


Figure A-4 Attributes of SOM coordinates

The Space Oblique Mercator (SOM) map projection was developed to support LandSat which covers the same large geographic extent as MISR.

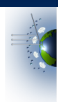
SOM was designed to minimize the shape distortion and scale errors throughout the length of the MISR swath near the satellite ground track.

SOM X is in the direction of the Spacecraft ground track and SOM Y is perpendicular X

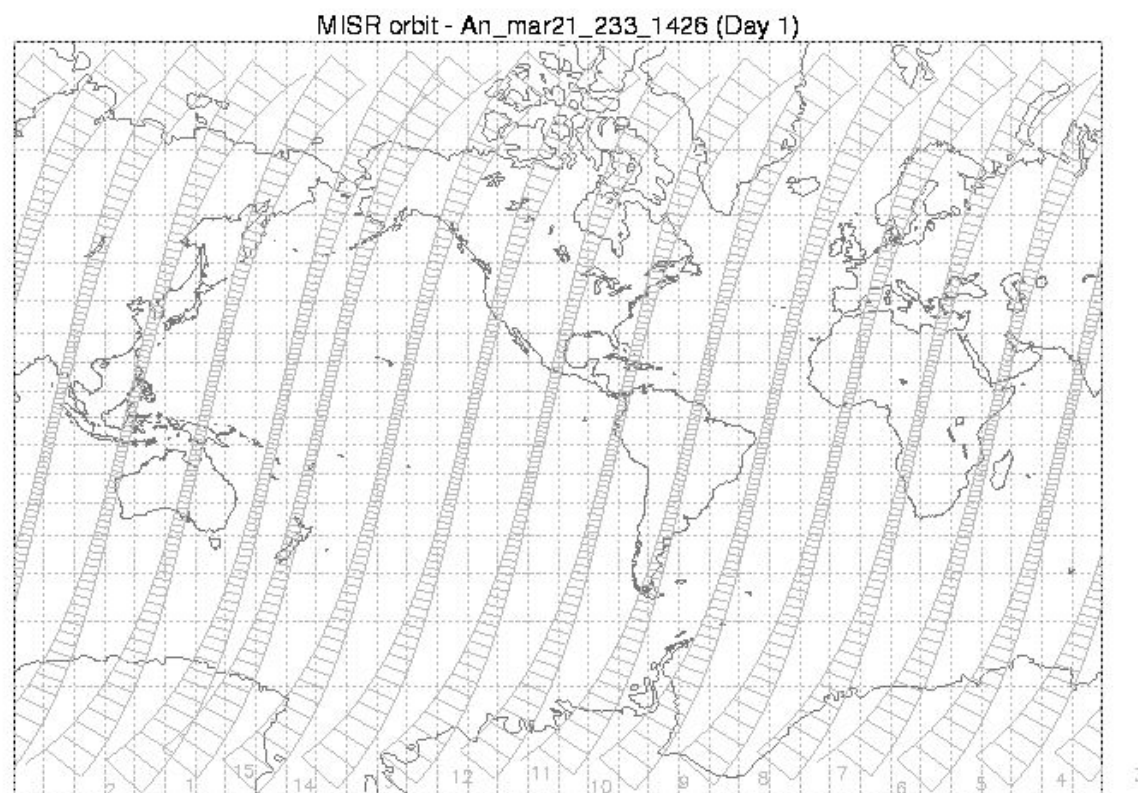


# SOM Background

- Terra follows a pattern of orbits which repeats after 233 unique orbits
- Each of the 233 possible orbits is called a path
- SOM defines a separate projection for each of these paths
- For MISR, a path begins at a particular longitude as the satellite crosses the ascending node.
- This path implies a specific longitude of ascending node, which implies a specific SOM projection applicable to that path



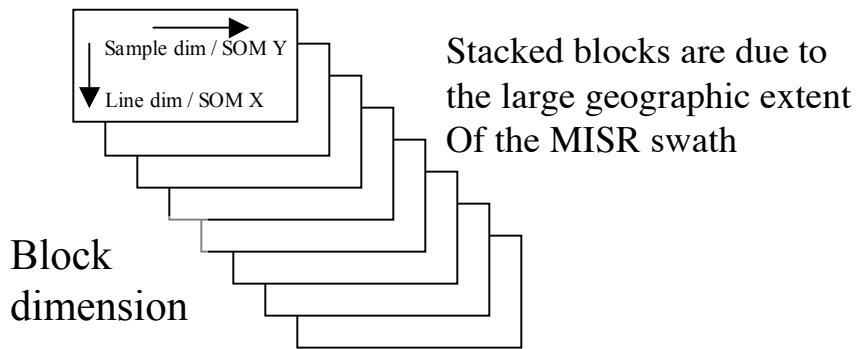
# MISR Orbital Paths/Blocks



# MISR HDF-EOS “Stacked Block” File vs. Aligned File

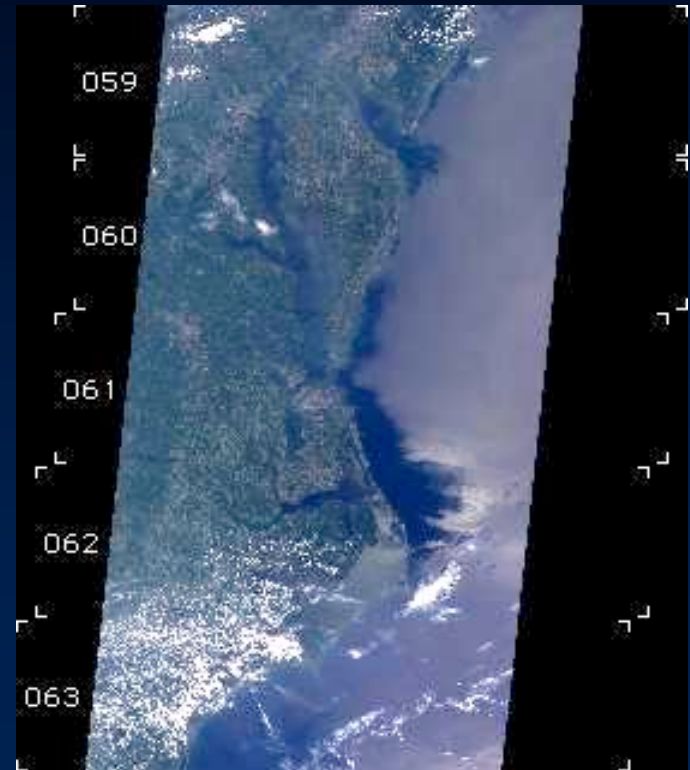
## Standard Product Files are “Stacked-Block”

### Red Channel Grid SDS (180 Stacked Blocks)



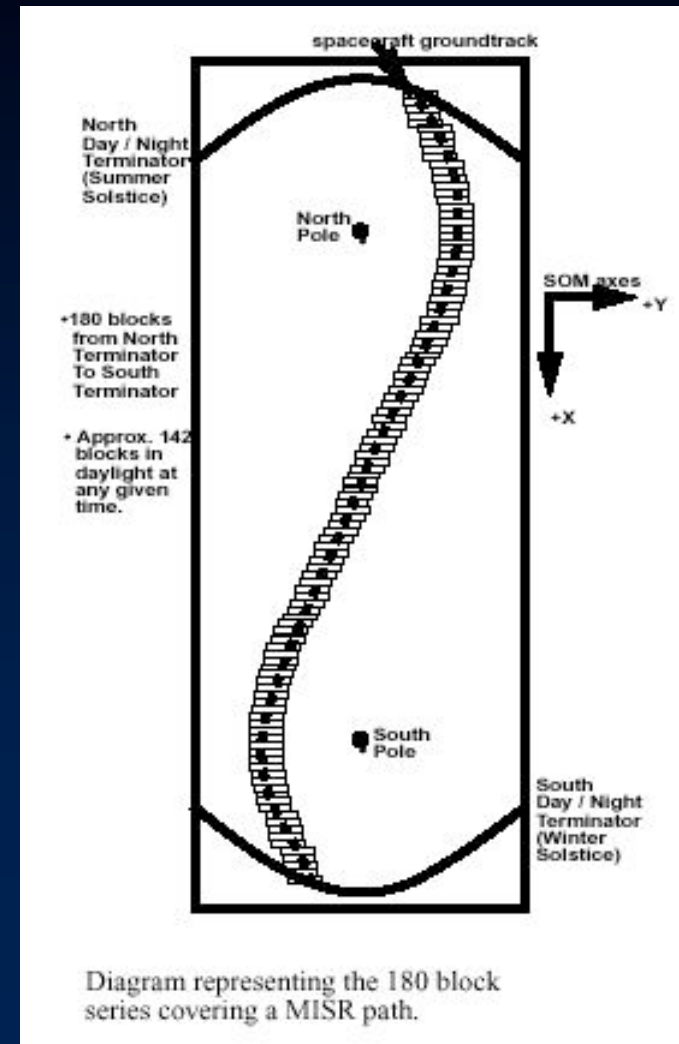
- SOM coordinates of top-block corners part of Grid metadata.
- Projection and orbital parameters part of Grid Metadata
- Offsets of each block from the one above is part of Stacked-block grid extension metadata.

## Conventional Product Files & Browse Product Files are Aligned



## MISR HDF-EOS “Stacked Block” Background

- HDF-EOS routines do NOT assemble the blocks. That is left for the user or the MISR Toolkit
- 180 blocks are defined for every MISR Product to make block index absolute
- However, roughly 142 blocks have data for any given orbit. The extra blocks are to allow for seasonal variation
- A Conventional Grid Product that does not use “stacked-block”, but rather a conventional HDF-EOS format is now available via the MISR order tool
- We will, however, preserve “stacked-block” Standard Product in processing



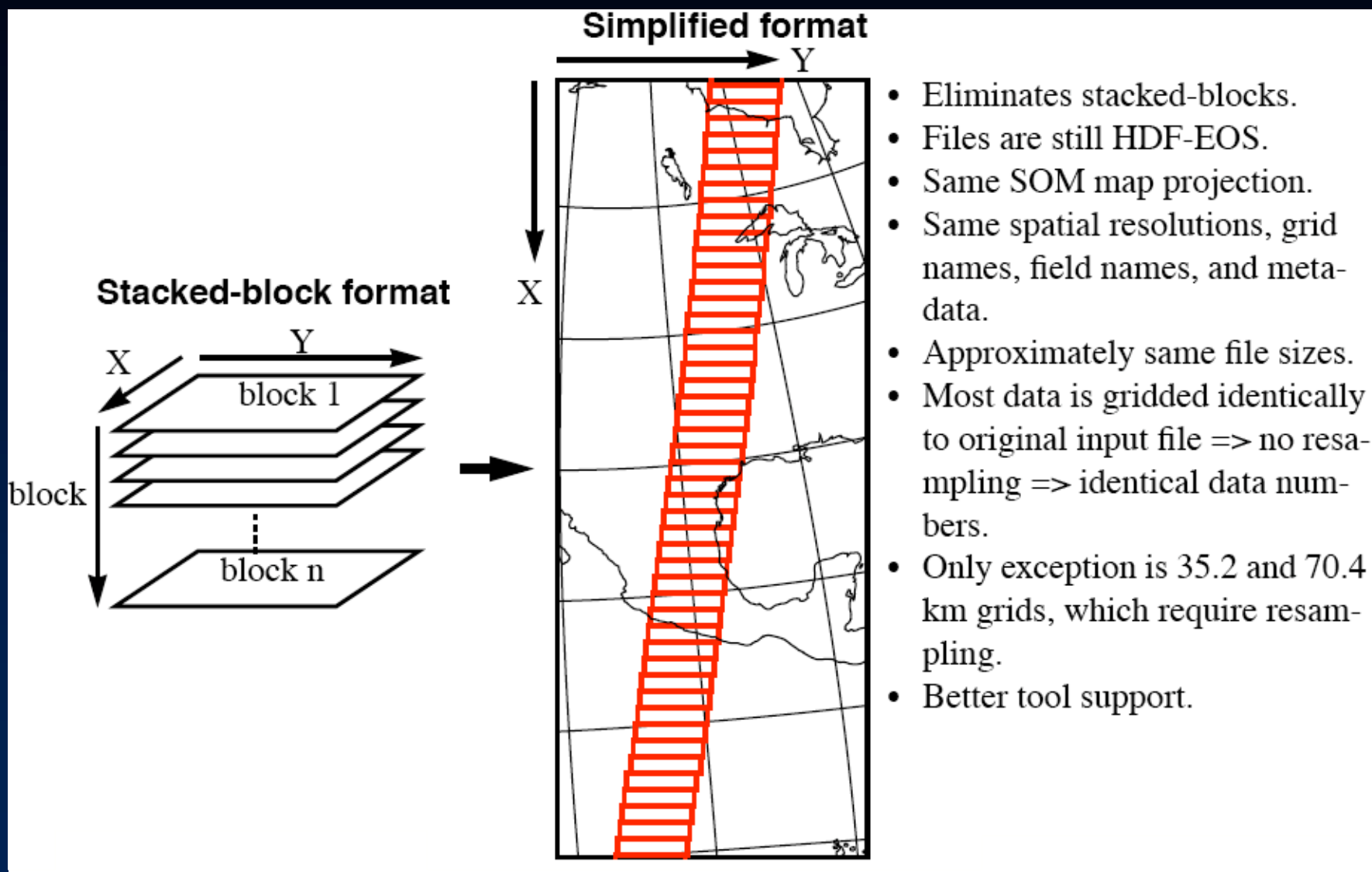
## Where does this pixel belong with the MISR HDF-EOS “Stacked Block” Scheme?

- Inside the HDF-EOS “stacked block grid” = (block, line, sample)
- Convert (block, line, sample)  $\leftrightarrow$  SOM (x,y)
  - Requires several metadata values and some arithmetic.
- Convert SOM (x,y)  $\leftrightarrow$  Lat/Lon
  - Requires use of GCTP map projection coordinate conversion library in HDF-EOS distribution.
- Units: Integral block, fractional line/sample; meters x/y; decimal degrees Lat/Lon.
- This process is described in the MISR Data Product Specification, Appendix A and also routines are provided in the MISR Toolkit.
- Or simply look up the Lat/Lon of the corresponding block, line, sample in the Ancillary Geographic Product (AGP) datasets (1.1km).



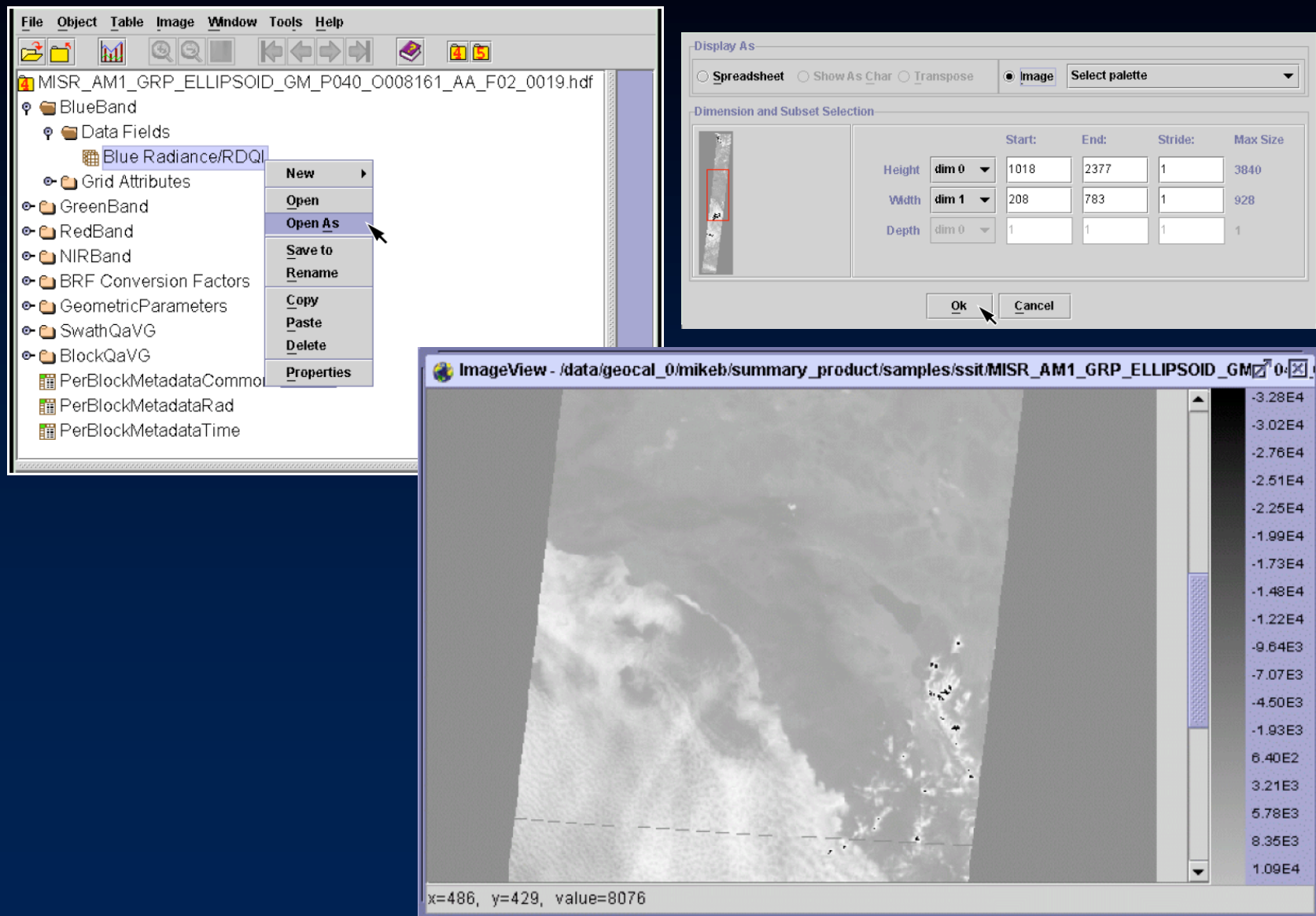
# What is the MISR “Conventional Grid” Product?

## Standard HDF-EOS Grid



# HDFView - L1B2 Imagery

“MISR Conventional Grid” Products ordered via the MISR order tool



# MISR Browse Tool

<http://eosweb.larc.nasa.gov/MISRBR/>

MISR Browse Tool

ATMOSPHERIC SCIENCES DATA CENTER

MISR Multi-angle Imaging SpectroRadiometer

Region Time Range Path Orbit MISR Home

Step 1

MISR Region Selection Tool

Move rectangle and resize if needed, or enter Lat/Lon coordinates.

North: 10.000 Lat: 0.000  
West: -10.000 East: 10.000 Lon: 0.000  
South: -10.000 Width: 20.000  
Height: 20.000

Select time range of interest.

Month Day Year Hour Min  
Start Time: Mar 03 2000 00 00 UTC  
End Time: Mar 27 2009 00 00 UTC

Get orbit info

MISR Information | MISR FAQ | ASDC Home Page | Questions/Feedback

Responsible NASA Official: John M. Kusterer  
Site Administration/Help: NASA Langley ASDC User Services ([larc@eos.nasa.gov](mailto:larc@eos.nasa.gov)).  
([Privacy Policy and Important Notices](#))  
Last Update:

MISR Browse Tool

ATMOSPHERIC SCIENCES DATA CENTER

MISR Multi-angle Imaging SpectroRadiometer

Region Time Range Path Orbit MISR Home

Step 1

MISR Path Tool

Enter a path number (1 - 233) and a time range to obtain a list of orbits within the time range that cover that path.

Path number:

Month Day Year Hour Min  
Start Time: Mar 03 2000 00 00 UTC  
End Time: Mar 27 2009 00 00 UTC

Get path info

MISR Information | MISR FAQ | ASDC Home Page | Questions/Feedback

Responsible NASA Official: John M. Kusterer  
Site Administration/Help: NASA Langley ASDC User Services ([larc@eos.nasa.gov](mailto:larc@eos.nasa.gov)).  
([Privacy Policy and Important Notices](#))  
Last Update:

MISR Browse Tool

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MISR Multi-angle Imaging SpectroRadiometer

Region Time Range Path Orbit MISR Home

Step 1

MISR Orbit Tool

Enter orbit number to obtain date, path, and view browse image.

Orbit number:

Get orbit info

MISR Information | MISR FAQ | ASDC Home Page | Questions/Feedback

Responsible NASA Official: John M. Kusterer  
Site Administration/Help: NASA Langley ASDC User Services ([larc@eos.nasa.gov](mailto:larc@eos.nasa.gov)).  
([Privacy Policy and Important Notices](#))  
Last Update:

MISR Browse Tool

ATMOSPHERIC SCIENCES DATA CENTER

MISR Multi-angle Imaging SpectroRadiometer

Region Time Range Path Orbit MISR Home

Step 1

MISR Time Range Tool

Enter time range to obtain orbits and paths.

Month Day Year Hour Min  
Start Time: Mar 03 2000 00 00 UTC  
End Time: Mar 27 2009 00 00 UTC

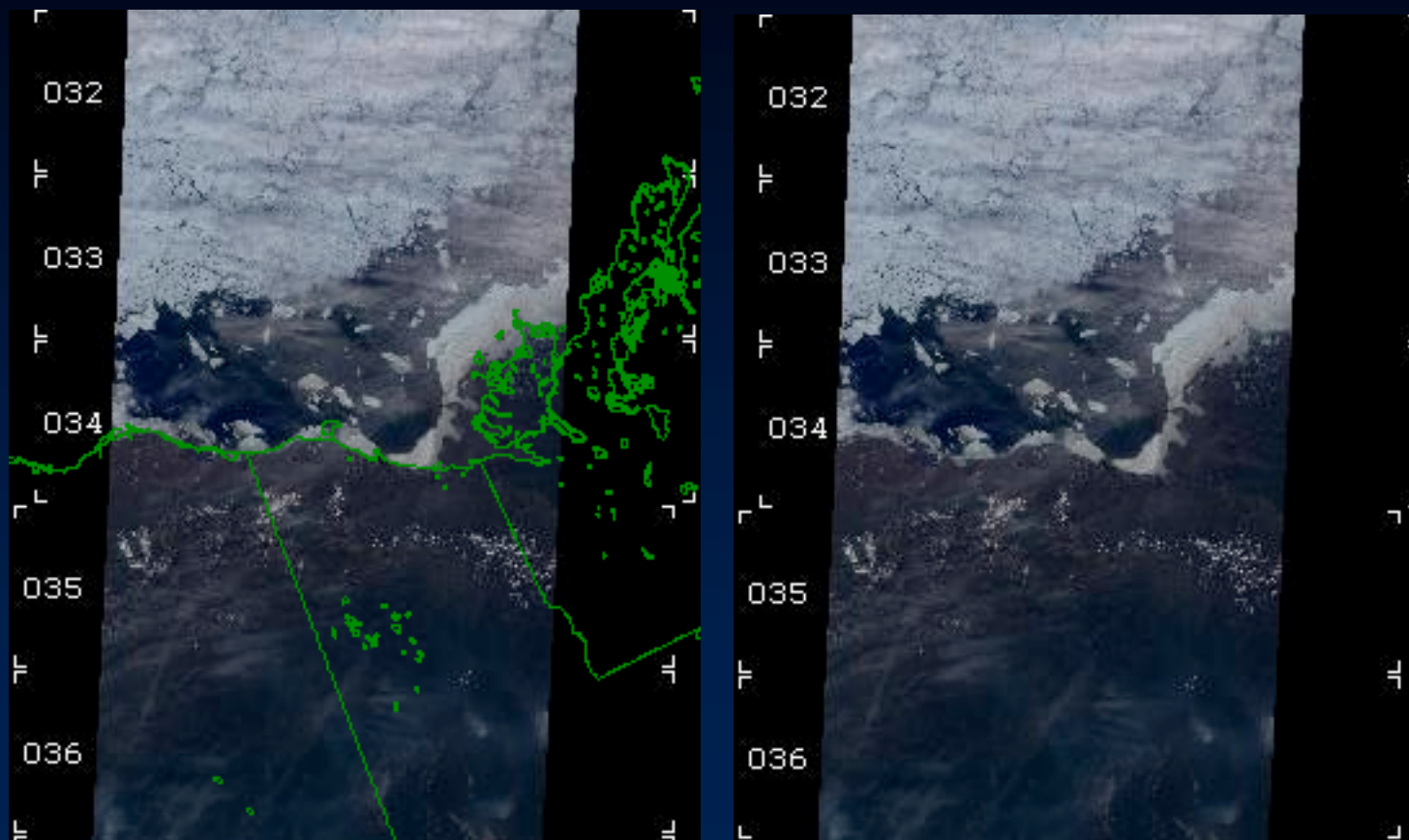
Get time info

MISR Information | MISR FAQ | ASDC Home Page | Questions/Feedback

Responsible NASA Official: John M. Kusterer  
Site Administration/Help: NASA Langley ASDC User Services ([larc@eos.nasa.gov](mailto:larc@eos.nasa.gov)).  
([Privacy Policy and Important Notices](#))  
Last Update:

# MISR L1B2 Browse Product

JPEG true-color imagery, all 9 cameras, 2.2 km sampling



# MISRView

## For the “Stacked Block” Products



- Maps path/orbit to time and date
- Assembles MISR blocks
- Reports Lat/Lon using the AGP
- Displays true color MISR imagery
- Can reproject MISR imagery
- Requires IDL or IDL VM
- Perspective tool
- Band slider tool
- Scroll tool
- Vector overlay tool
- Reprojection tool
- Color / Contrast tools



# MISRView – Main Menu

**MISRView Interface**

**snapshot**

**Source Data:** ☒ MISR ☐ AirMISR

**Choose MISR Orbit** **Choose MISR Blocks**

Orbit Date:    GMT:

Path:  Orbit:

Start Block:  Center lat,lon: 0.6, 142.3

End Block:  Center lat,lon: 0.6, 142.3

Number of Blocks:  Map Zoom: ☒ In ☐ Out

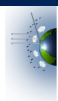
Cursor lat,lon: 58.3 , 00.

**Data** < **None Selected** > **Cross-track** 1100m **Along-track** 1100m

**Set Active Plane** **Clear Active Plane** **Plane Display Options...**

<b>RED PLANE</b> NOT SET	<b>GREEN PLANE</b> NOT SET	<b>BLUE PLANE</b> NOT SET
<b>ANCILLARY 1 PLANE</b> NOT SET	<b>ANCILLARY 2 PLANE</b> NOT SET	<b>ANCILLARY 3 PLANE</b> NOT SET

**Data Selection Parameters:**   **Rotate**  **Deg.**



# MISRView – L1B2 imagery

[fjorgyn.jpl.nasa.gov/home/misra1](http://fjorgyn.jpl.nasa.gov/home/misra1)

[fjorgyn.jpl.nasa.gov/ber/69](http://fjorgyn.jpl.nasa.gov/ber/69)  
[fjorgyn.jpl.nasa.gov/ber/70](http://fjorgyn.jpl.nasa.gov/ber/70)

**MISR\_VIEW 4.1**  
 Controls Quit Help

**Data Selection Interface**

Longitude: 15.2170 degrees  
 Latitude: 34.4562 degrees  
 RED PLANE (block #, block-y, block-x, data value): 63, 173, 70, 2464  
 GREEN PLANE (block #, block-y, block-x, data value): 63, 173, 70, 3464  
 BLUE PLANE (block #, block-y, block-x, data value): 63, 173, 70, 7180  
 ANCILLARY PLANE #1 (block #, block-y, block-x, data value): 63, 173, 70, 36  
 ANCILLARY PLANE #2 (block #, block-y, block-x, data value): 63, 11, 5, 308.27800  
 ANCILLARY PLANE #3 (block #, block-y, block-x, data value): 63, 11, 5, 20.931710

Orbit Date: Jul 22 2001 GMT: 09 22 4  
 Path: 187 Orbit: 8476 Orbit List, Pat  
 Start Block: 58 Center lat,lon: 40.6,  
 End Block: 67 Center lat,lon: 29.4,  
 Number of Blocks: 10 Map Zoom: In Out  
 Cursor lat,lon: 1350.0, 23.0

< GP, GMP, P187, 0008476\_\_\_Geome > Cross-track 1100m Along-track

Set Active Plane Clear Active Plane Plane Display Options.

<b>RED PLANE</b> ORBIT 8476 GRP, ELLIPSOID, AN, P187, 0008476 RedBand_Red Radiance/RDQI 1100m (cross-track) x 1100m (along-track)	<b>GREEN PLANE</b> ORBIT 8476 GRP, ELLIPSOID, AN, P187, 0008476 GreenBand_Green Radiance/RDQI 1100m (cross-track) x 1100m (along-track)	<b>BLUE PLANE</b> ORBIT 8476 GRP, ELLIPSOID, AN, P187, 0008476 BlueBand_Blue Radiance/RDQI 1100m (cross-track) x 1100m (along-track)
<b>ANCILLARY 1 PLANE</b> ORBIT 8476 AGP, P187 Standard_AveSceneElev 1100m (cross-track) x 1100m (along-track)	<b>ANCILLARY 2 PLANE</b> ORBIT 8476 GP, GMP, P187, 0008476 GeometricParameters_SolarAzimuth 1100m (cross-track) x 1100m (along-track)	<b>ANCILLARY 3 PLANE</b> ORBIT 8476 GP, GMP, P187, 0008476 GeometricParameters_SolarZenith 1100m (cross-track) x 1100m (along-track)

Data Selection Parameters: Store Recall Rotate 0.0 Deg. Create Viewer

Utilities Tools Modes Kill

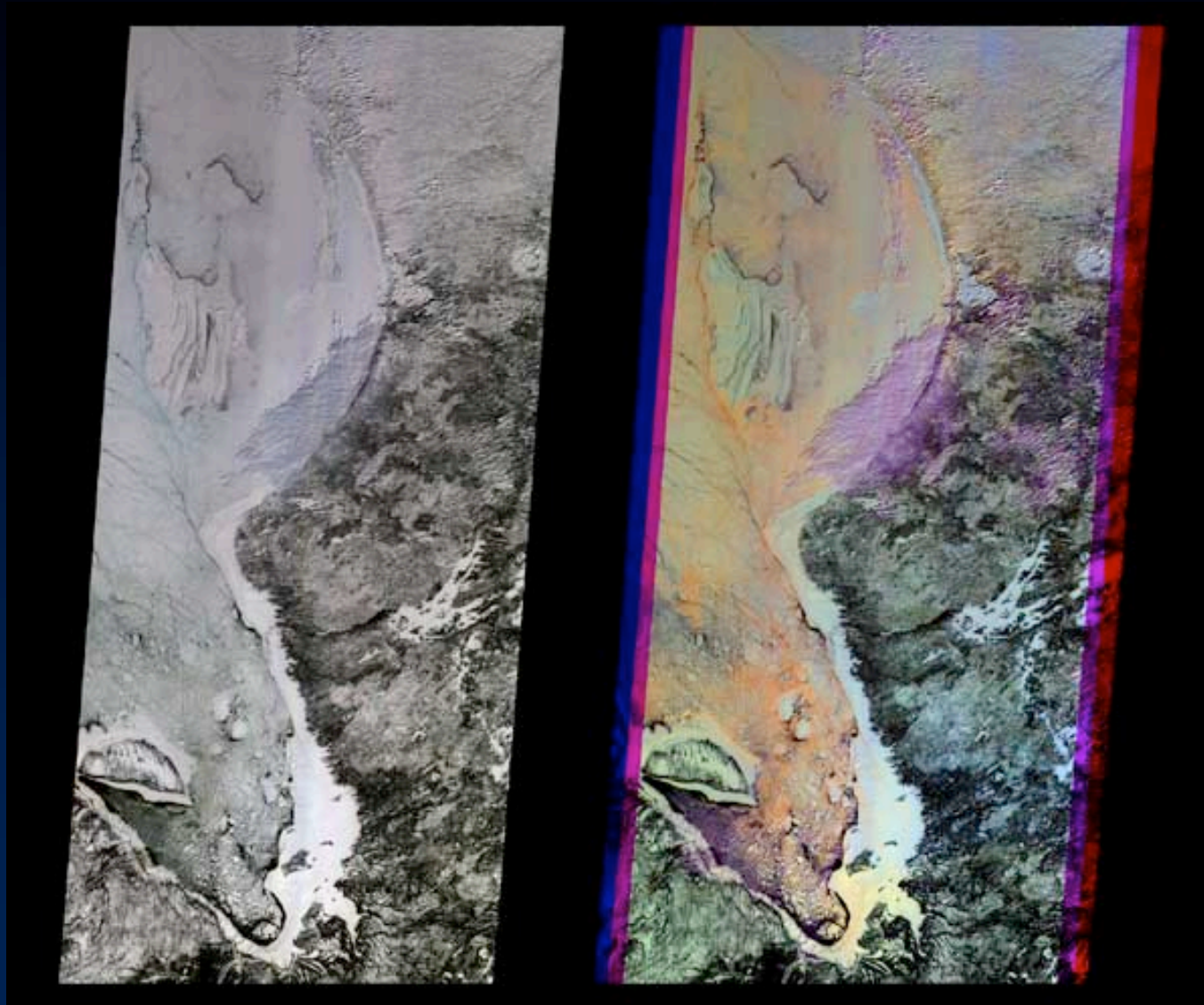
w=2 p=187 o=8476 b=58.67 z=0.500000 m=

snapshot

Camera



## MISRView – MISR Vision (R-Ba, G-An, B-Bf)



# MISR INteractive eXplorer (MINX)



A interactive application that functions both as a general-purpose tool to visualize MISR data and as a specialized tool to analyze properties of smoke, volcanic and dust plumes

It includes high-level options to create:

- Map views of MISR orbit locations
- Scrollable, single-camera, RGB images of MISR level 1B2 (L1B2) radiance data
- Animations of the nine MISR camera images that provide a 3D perspective of the scenes that MISR has acquired

Some of the specialized options in MINX enable the user to:

- Display plots of top-of-atmosphere BRF vs. camera-angle for pixels you click on
- Save images and animations to disk in various formats
- Apply a geometric registration correction to warp camera images when the standard processing correction is inadequate
- Difference the images of two MISR orbits that share a path (identical ground track)
- Construct pseudo-color images by assigning different combinations of MISR cameras to the RGB display channels
- Interactively digitize smoke, volcanic or dust plumes and automatically retrieve heights and winds, albedos, aerosol properties and fire power and brightness temperatures associated with those plumes

<http://www.openchannelfoundation.org/projects/MINX/>

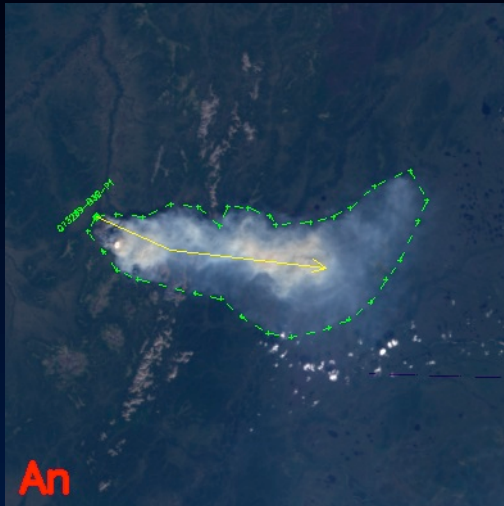




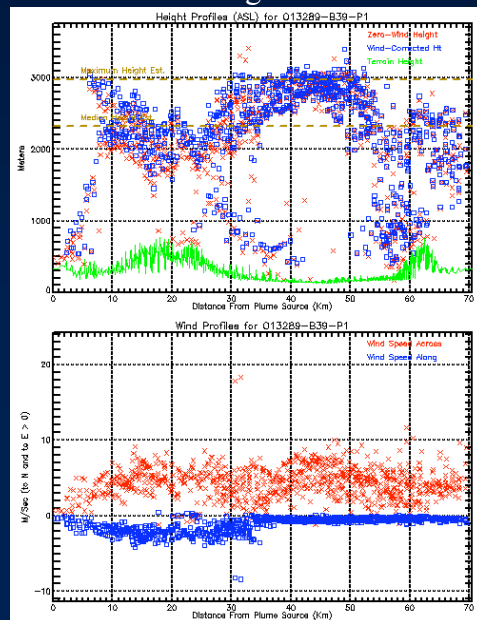
# MISR INteractive eXplorer (MINX)



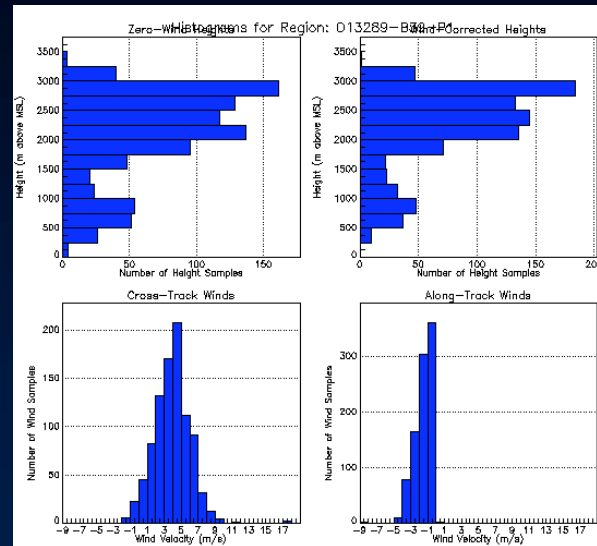
Digitized Plume Points



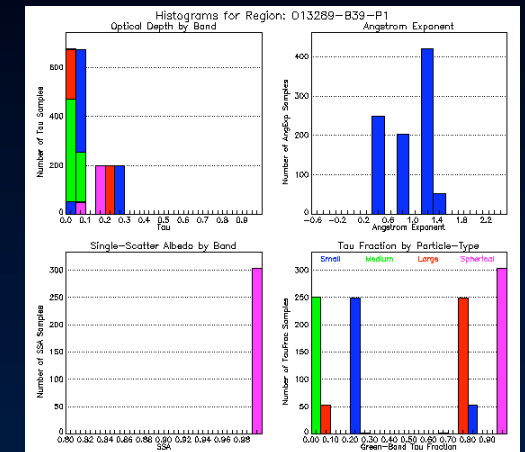
Wind & Height Profiles



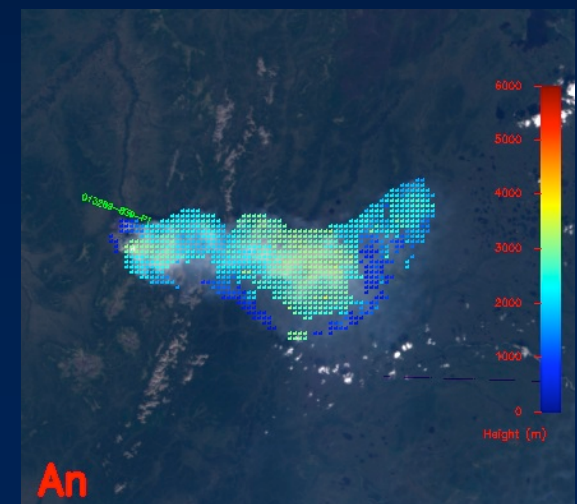
Wind Height Histogram



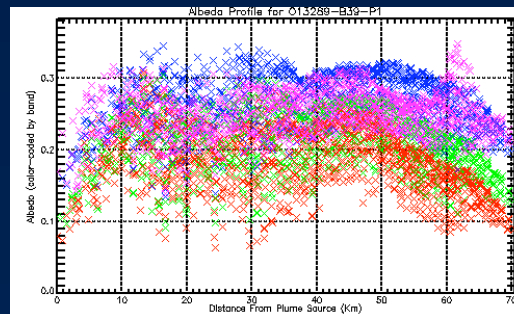
Aerosol Histogram



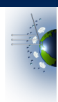
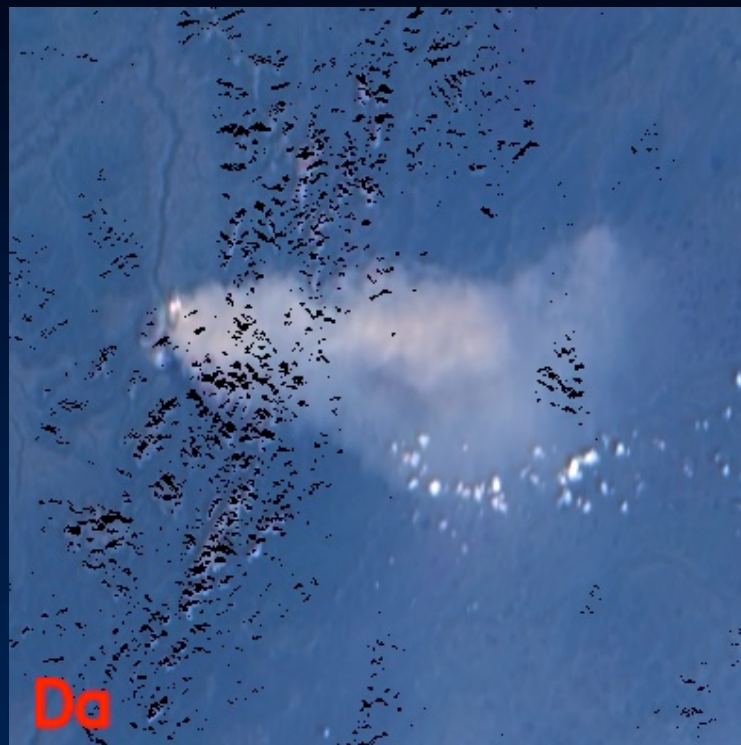
Plume Height Contour



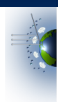
Albedo Profile



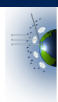
# MISR INteractive eXplorer (MINX)



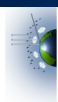
# MISR INteractive eXplorer (MINX)



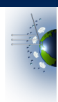
# MISR INteractive eXplorer (MINX)



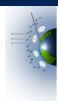
# MISR INteractive eXplorer (MINX)



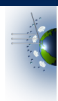
# MISR INteractive eXplorer (MINX)



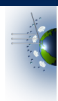
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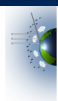
# MISR INteractive eXplorer (MINX)



# MISR INteractive eXplorer (MINX)

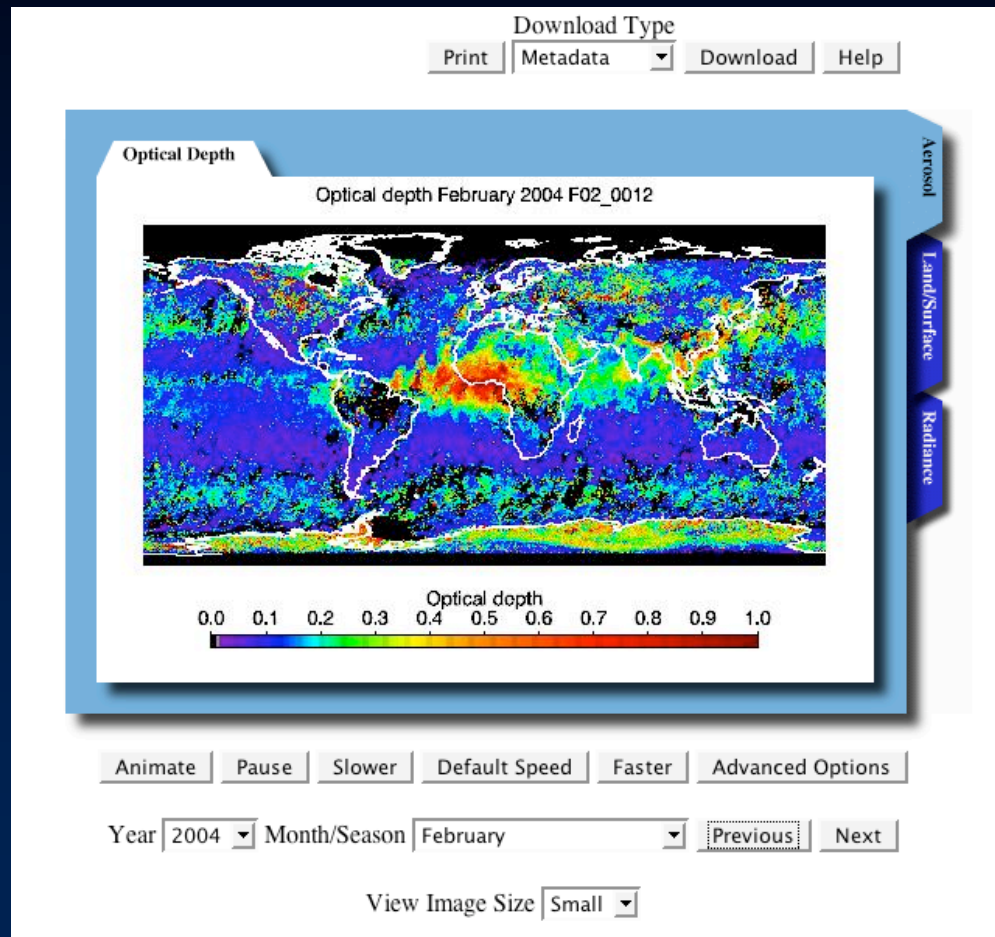


# MISR INteractive eXplorer (MINX)



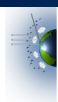
# MISR Level 3 Overview Web Page

- <http://eosweb.larc.nasa.gov/PRODOCS/misr/level3/overview.html>
- Can view jpegs of all available Level 3 data.
- Can view by product and by month or season.
- Can view animation through a year's worth of data.
- Can directly download Level 3 HDF files.





# MISR Level 3 Data File Format



- Level 3 data files
  - In standard HDF-EOS grid format.
  - Not in more complicated “stacked block” grid used by Level 1 and Level 2.
  - Can be read by any tool that knows HDF-EOS (i.e, IDL).
  - To simply view data, use Level 3 web page - no need to work with HDF-EOS file.
  - Level 3 HDF-EOS data files can be downloaded directly from the overview web page.



# Aerosol Measurement and Processing System

**AMAPS is a community-based distributed analysis environment for aerosol science.** It is a collaborative project with three partners: the Jet Propulsion Laboratory (JPL), the University of Michigan (UM), and NASA's Langley Atmospheric Sciences Research Center (LaRC).





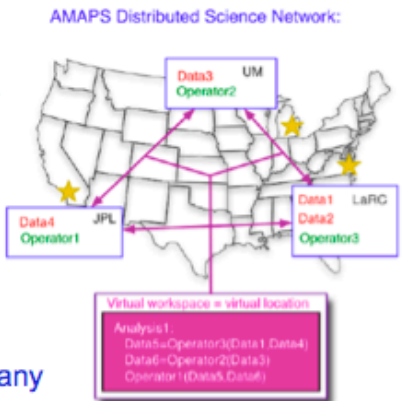
National Aeronautics and Space Administration  
Jet Propulsion Laboratory  
California Institute of Technology  
Pasadena, California

**AMAPS is a grid-enabled, distributed computing and analysis environment for aerosol research.**

The "grid" enables argument passing over the web (including code and data).

Creates a virtual workspace not tied to any single physical location.

AMAPS Distributed Science Network:



Web service = remotely callable, installed function. No need to pass code to remote computer.

**AMAPS project goals:**

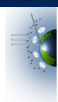
- Infrastructure for accessing Level 2 aerosol data sets
- New analysis methods to exploit distributed data and grid capabilities
- Demonstration science analysis

The figure illustrates the AMAPS concept:

- A virtual workspace in which executable "operators" can be invoked on any member data set regardless of actual physical locations of data, operators and users.
- AMAPS uses the SciFlo grid workflow engine to call remote operators (web services), pass arguments to them, and/or move code and data over the world-wide web in whatever order or configuration is most efficient.

- This makes access to data easier, allows users to build on and reuse each other's operators, and increases computational power.

<http://df3.jpl.nasa.gov> or <http://amaps.jpl.nasa.gov>



# Aerosol Measurement and Processing System

Service users access AMAPS capabilities through web pages that display predefined SciFlo workflows

## MisrSubsetter Workflow

**MisrSubsetter**

Subset a list of MISR granules by lat/lon region and variable list, yielding a list of netCDF files containing the space and parameter subset.

**SciFlo Inputs**

datasetName:	MISR	data source
level:	AS_AEROSOL	data product from source
startTime:	2001-01-01 00:00:00	time range beginning
endTime:	2001-01-05 00:00:00	time range ending
latMin:	-30.	latitude/longitude bounding box
latMax:	10.	
lonMin:	0.	
lonMax:	30.	
misrGridName:	RegParamsAer	name of the HDF "grid" containing parameters
misrVariables:	['RegBestEstimateSpectralOptDepth[1]', 'RegMeanSpectralSSA[1]', 'RegBestEstimateAngstromExponent']	python-style list of quoted parameter names in HDF grid
misrVersion:	F09	MISR data product version number (leave blank to obtain all versions)
label:	_aod_subset	tag used in output file names to identify your files
<input type="button" value="submitSciFlo"/> <input type="button" value="submit w/ no cache"/>		

Submit this job. AMAPS remembers your previous submission, and caches intermediate outputs. submit w/ no cache forces intermediate output to be regenerated. This option takes longer, but flushes previous versions.

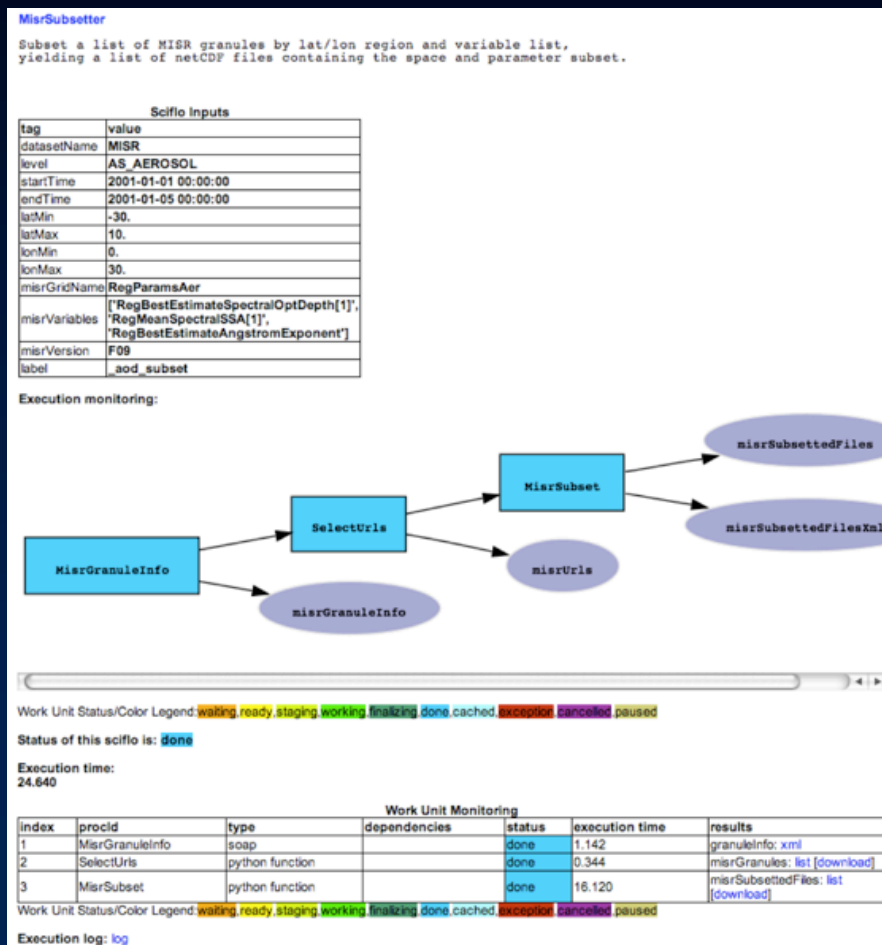
### Input Web Page

**SciFlo Outputs**

tag	value
misrGranuleInfo	str [download]
misrUrls	list [download]
misrSubsettedFiles	str [download]
misrSubsettedFiles.Xml	list [download]

Annotated sciFlo: [xml](#)

### OutPut Web Page



### Processing Web Page

# Aerosol Measurement and Processing System

Power users author their own XML documents, bypassing the web interface

## Power users capabilities:

- Have the flexibility to create their own executables in python (and eventually in any language or package of their choice)
- Can chain together with existing AMAPS operators, web services, and even other workflows
- Execute their workflows from the command line on any computer equipped with AMAPS software
- Such a computer is called an AMAPS node
- Presently there are three AMAPS nodes: one at JPL, one at the University of Michigan, and one at LaRC

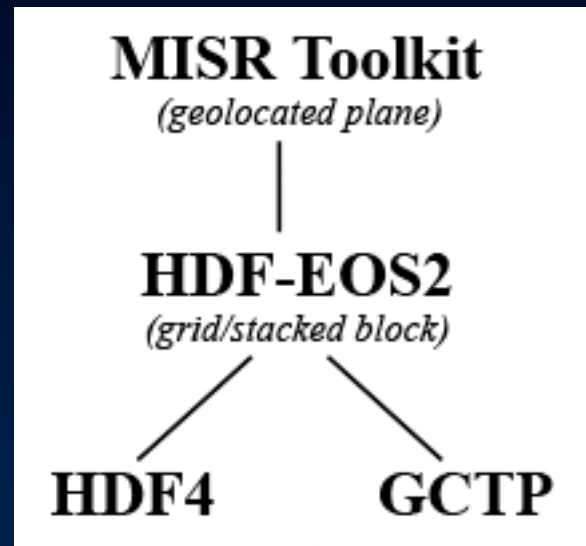
## Four key technologies are at the heart of AMAPS:

- Python programming language
- XML standard
- Simple Object Access Protocol (SOAP)
- SciFlo grid workflow system

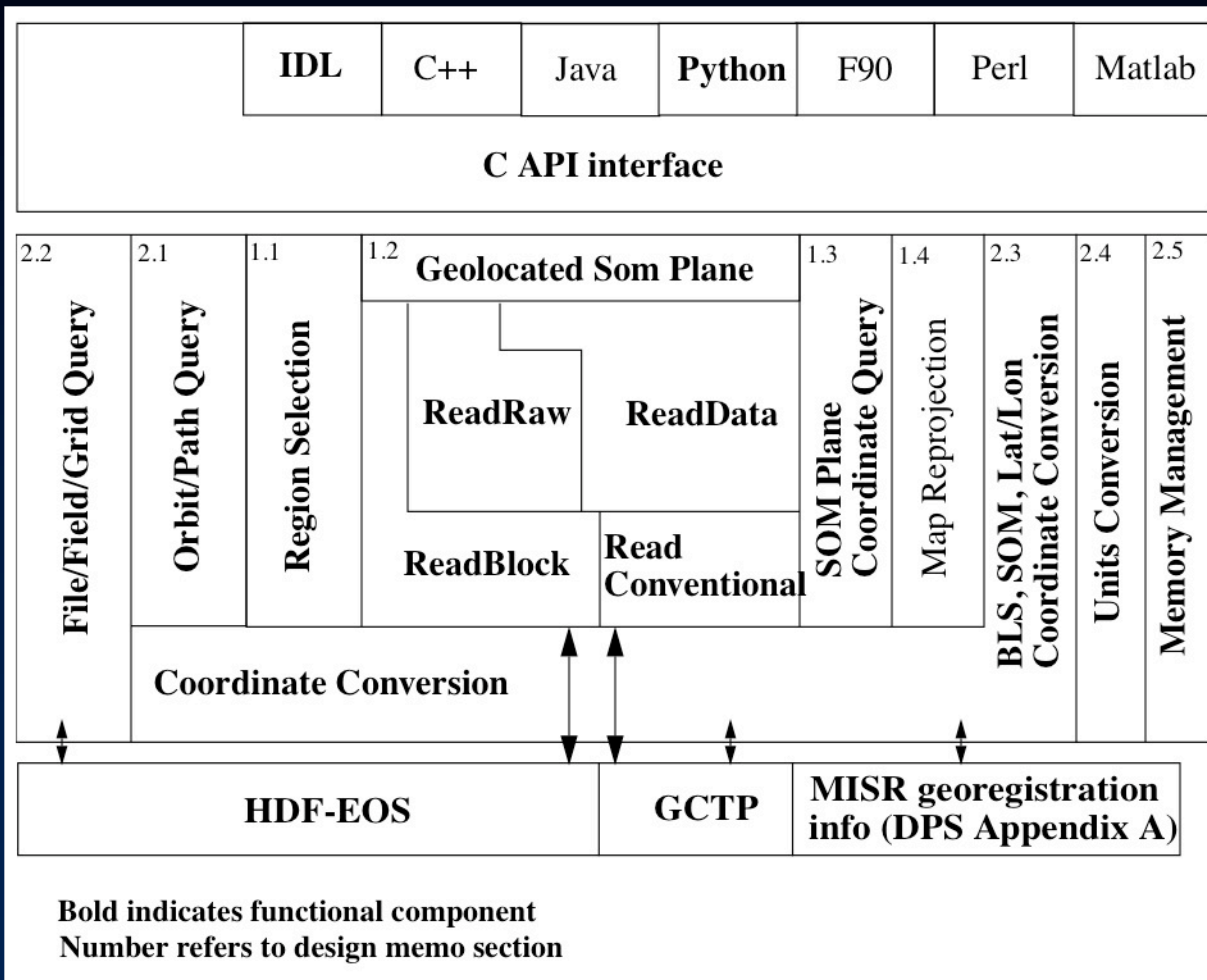


# Introduction to the MISR Toolkit API

- The MISR Toolkit API provides simplified MISR data access and geolocation functionality utilizing the GCTP metadata, instead of an ancillary data set lookup
- Abstract MISR “stacked block HDF-EOS grid” to a geolocated SOM projected plane with blocks assembled and fields unpacked and unscaled
- Reads MISR L1B2, L2 and Conventional products
- There are no other tools available that simultaneously make use of the GCTP geolocation metadata and are aware of the MISR “stacked block” format for all of the MISR products



# MISR Toolkit API Overview



# MISR Toolkit API Components (Partial List)

## **1.1) Region Selection**

MtkSetRegionByUlcLrc()  
MtkSetRegionByLatLonExtent()  
MtkSetRegionByPathBlockRange()

## **1.2) Reading a Geolocated SOM plane**

MtkReadData()  
MtkReadRaw()  
MtkReadBlockRange()

## **1.3) SOM Plane Coordinate Query**

MtkLSToLatLon()  
MtkLatLonToLS()  
MtkLSToSomXY()  
MtkSomXYToLS()

## **1.4) Map Reprojection**

TBD

## **2.1) Orbit/Path Query**

MtkLatLonToPathList()  
MtkRegionToPathList()  
MtkTimeToOrbitPath()  
MtkTimeRangeToOrbitList()  
MtkPathTimeRangeToOrbitList()  
MtkOrbitToPath()

## **2.2) File/Grid/Field Query**

MtkMakeFilename()  
MtkFindFileList()  
MtkFileToGridList()  
MtkFileGridToFieldList()

## **2.3) Coordinated Conversion**

MtkPathToProjParam()  
MtkLatLonToBlS()  
MtkBlSToLatLon()  
MtkSomXYToBlS()  
MtkBlSToSomXY()  
MtkLatLonToSomXY()  
MtkSomXYToLatLon()

## **2.4) Unit Conversion**

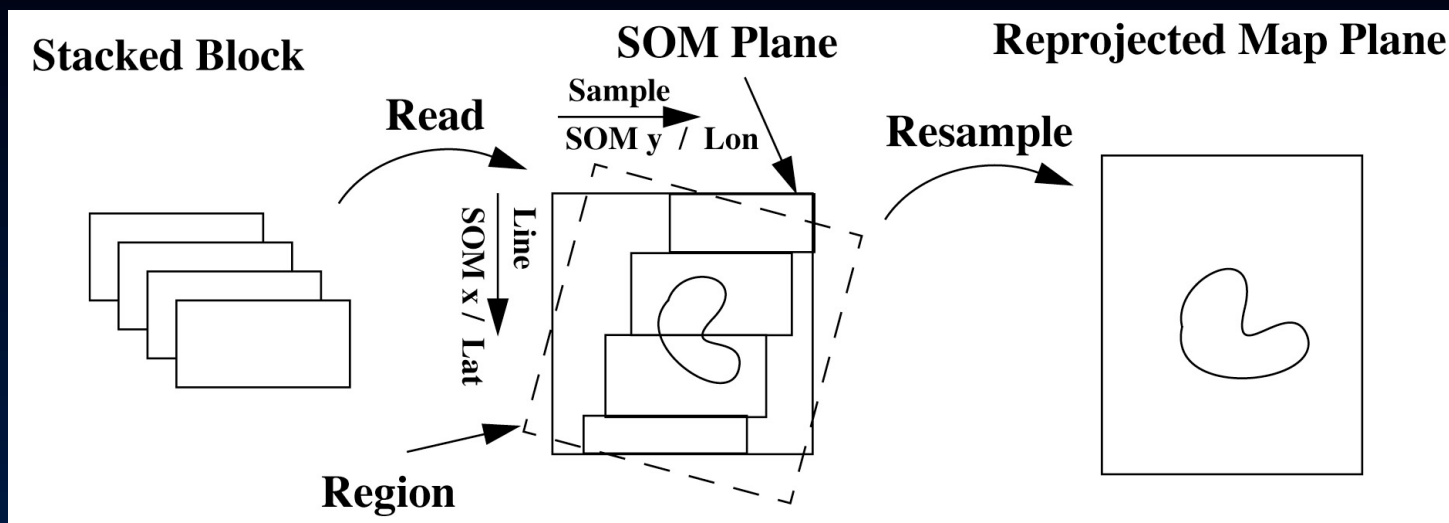
MtkDmsToDd()  
MtkDdToDms()  
MtkDdToRad()  
MtkRadToDd()  
MtkDmsToRad()  
MtkRadToDms()

## **2.5) Memory Management**

MtkDataBufferAllocate()  
MtkDataBufferFree()

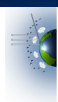


# MISR Toolkit API Concept



- 1) Select a geographic region of interest
- 2) Read a geolocated SOM plane from any number of MISR product files using the selected region. The region will be “snapped” to the geolocated SOM grid determined by the path number of the product
- 3) Query the coordinates of the SOM plane, mapping between plane line/sample, SOM x/y, Latitude/Longitude and “stacked-block” block, line, sample

Note: Adjacent paths are actually separate SOM projections, so a map re-projection may be needed to compare between separate MISR paths

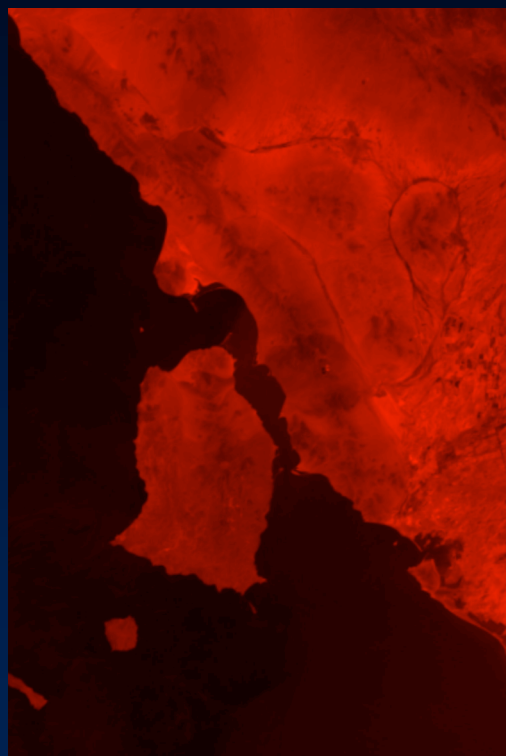


# SetRegion, ReadData, MapQuery & CoordQuery

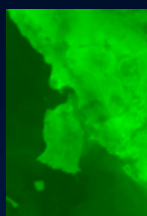
1) mtk\_setregion\_by\_latlon\_extent(29.15, -112.2, 150, 100, "km", region)

2) filename = "MISR\_AM1\_GRP\_ELLIPSOID\_GM\_P037\_O029058\_AA\_F03\_0024.hdf"

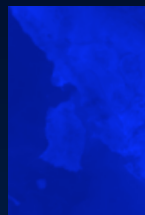
3) mtk\_readdata(filename, "RedBand", "Red BRF", region, red, redmap)



4) mtk\_readdata(filename, "GreenBand", "Green BRF", region, gm, gmmap)



5) mtk\_readdata(filename, "BlueBand", "Blue BRF", region, blu, blumap)



6) img = [[[red]], [[rebin(gm,ns,nl)]], [[rebin(blu,ns,nl)]]]

7) mtk\_ls\_to\_latlon(redmap, 0, 0, ulclat, ulclon)

8) mtk\_ls\_to\_latlon(redmap, redmap.nline, redmap.nsample, lrclat, lrclon)

9-12) mtk\_dd\_to\_deg\_min\_sec(ulclat/ulclon/lrclat/lrclon, deg, min, sec)

13) mtk\_ls\_to\_latlon(redmap, 288, 192, lat, lon)

14) mtk\_latlon\_to\_ls(redmap, lat, lon, line, sample)

15) mtk\_ls\_to\_somxy(redmap, 288, 192, somx, somy)

16a) mtk\_latlon\_to\_bls(37, 275, lat, lon, block, line, sample)

16b) mtk\_somxy\_to\_bls(37, 275, somx, somy, block, line, sample)

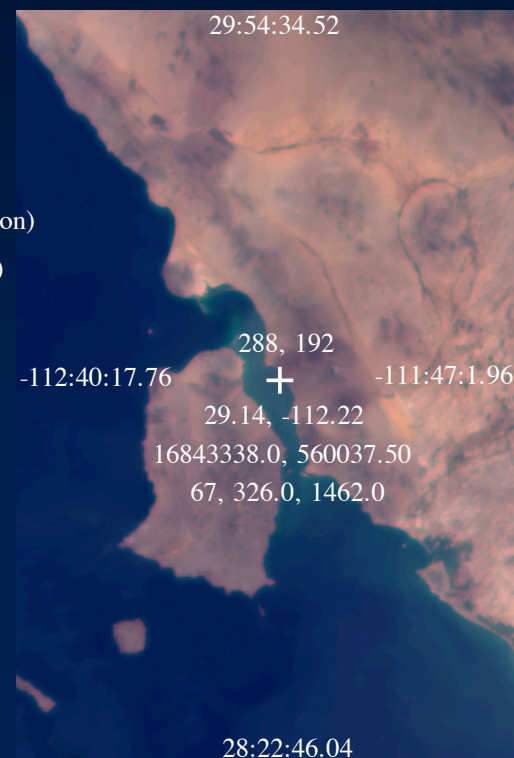
17) mtk\_region\_to\_pathlist(region, pathcnt, pathlist)

pathcnt = 5 pathlist = 34 35 36 37 38

18) mtk\_path\_timerange\_to\_orbitlist(37, '2005-12-01T00:00:00Z', '2005-12-31T23:59:59Z', orbitcnt, orbitlist)  
orbitcnt = 2 orbitlist = 31854 32087

19) mtk\_path\_timerange\_to\_orbitlist(38, '2005-12-01T00:00:00Z', '2005-12-31T23:59:59Z', orbitcnt, orbitlist)  
orbitcnt = 2 orbitlist = 31723 31956

20) mtk\_orbit\_to\_path(31723, path)  
path = 38



## MISR Toolkit API Concept (cont.)

In addition to L1B2, L2 and Conventional MISR data access the MISR toolkit has the ability to

- Perform coordinate conversions between lat/lon <-> SOM x/y <-> line/sample <-> block/line/sample
- Inter-compare MISR data with other data sets geographically
- Query a MISR product file to retrieve such information as block range, file version, file type, grid list, field list (including unpacked/unscaled fields), dimension list, metadata, etc.
- Construct MISR filenames and search a directory tree for the file
- Convert between path, orbit and time range
- Determine which paths/orbits cross a particular geographic location or region within a given time range
- Read a stack of blocks without assembling them (with the coordinate conversion capability, determining geolocation is trivial)



# FileQuery, OrbitPath, CoordQuery & MapQuery

Center Latitude (-90.0 <= lat <= 90.0): 34.00000

Center Longitude (-180.0 <= lon <= 180.0): -120.00000

Define extent in lat/lon

Latitudinal Extent (0.0 < extent <= 180.0): 10.00000

Longitudinal Extent (0.0 < extent <= 360.0): 5.00000

Starting Time

Year: 2005 Month: 6 Day: 1 Hour: 0 Minute: 0

Ending Time

Year: 2005 Month: 12 Day: 31 Hour: 0 Minute: 0

Get Information Quit Help

Latitude: 34.0000, Longitude: -120.000

Start Time (yyyymmddhhmmss): 20050601000000

Start Time (yyyymmddhhmmss): 20051231000000

Show paths intersecting region

Path List

38  
39  
40  
41  
42  
43  
44  
45  
46

Orbit List For Path 42

29102  
29335  
29568  
29801  
30034  
30267  
30500  
30733  
30966  
31199  
31432  
31665

Block Range: 59 through 67

E X I T


Image Coordinates  
LINE: 32 SAMPLE: 218

SOM Coordinates  
SOM\_X: 16366900. SOM\_Y: 451000.00

Block/Line/Sample Coordinates  
BLOCK: 64 LINE: 32.0000 SAMPLE: 218.000

Latitude/Longitude  
Latitude: 33.526397 Longitude: -115.87881

DATA VALUE (RED PLANE): 33.5264  
DATA VALUE (GREEN PLANE): -115.879  
DATA VALUE (BLUE PLANE): 0.00000



Pick one

- 0) RegParamsLnd
- 1) SubregParamsLnd

: 1

Pick one

- 0) LandHDRF
- 1) Raw LandHDRF
- 2) Flag LandHDRF
- 3) LandHDRFUnc
- 4) Raw LandHDRFUnc
- 5) RDQI
- 6) LandBHR
- 7) Raw LandBHR
- 8) LandBHRRelUnc
- 9) Raw LandBHRRelUnc
- 10) LandBRF
- 11) Raw LandBRF
- 12) Flag LandBRF
- 13) LandDHR
- 14) Raw LandDHR
- .....
- 43) SubrVar
- 44) Raw SubrVar

: 0

Enter dimension for LandHDRF

NBandDim(0-3)

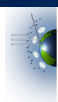
: 2

NCamDim(0-8)

: 3

LandHDRF[2][3]

SubregParamsLnd/LandHDRF[2][3]



# MISR Toolkit Platform and Language Availability

## Platforms and Languages Available (version 1.2)

- C library on Linux, Mac OS X and Windows XP
- IDL on all platforms via dynamically loadable library
- Python bindings for Linux and Mac OS X
- Command line utilities on Linux and Mac OS X (Useful for scripting or function usage examples)

[http://www.openchannelfoundation.org/projects/MISR\\_Toolkit/](http://www.openchannelfoundation.org/projects/MISR_Toolkit/)



# MISR Toolkit IDL example to convert to ENVI

```
pro convert2envi, filename, envifilename

path = 0
status = mtk_file_to_path(filename, path)
if (status ne 0) then exit

status = mtk_file_to_blockrange(filename, start_block, end_block)
if (status ne 0) then exit

status = mtk_file_to_gridlist(filename, ngrid, gridlist)
if (status ne 0) then exit
gridname = gridlist[0]

status = mtk_file_grid_to_fieldlist(filename, gridlist[igrid], nfield, fieldlist)
if (status ne 0) then exit
fieldname = fieldlist[0]

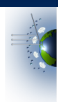
status = mtk_file_grid_field_to_dimlist(filename, gridname, fieldname, ndim, dimnames, dimsizes)
if (status ne 0) then exit

status = mtk_setregion_by_path_blockrange(path, start_block, end_block, region)
if (status ne 0) then exit

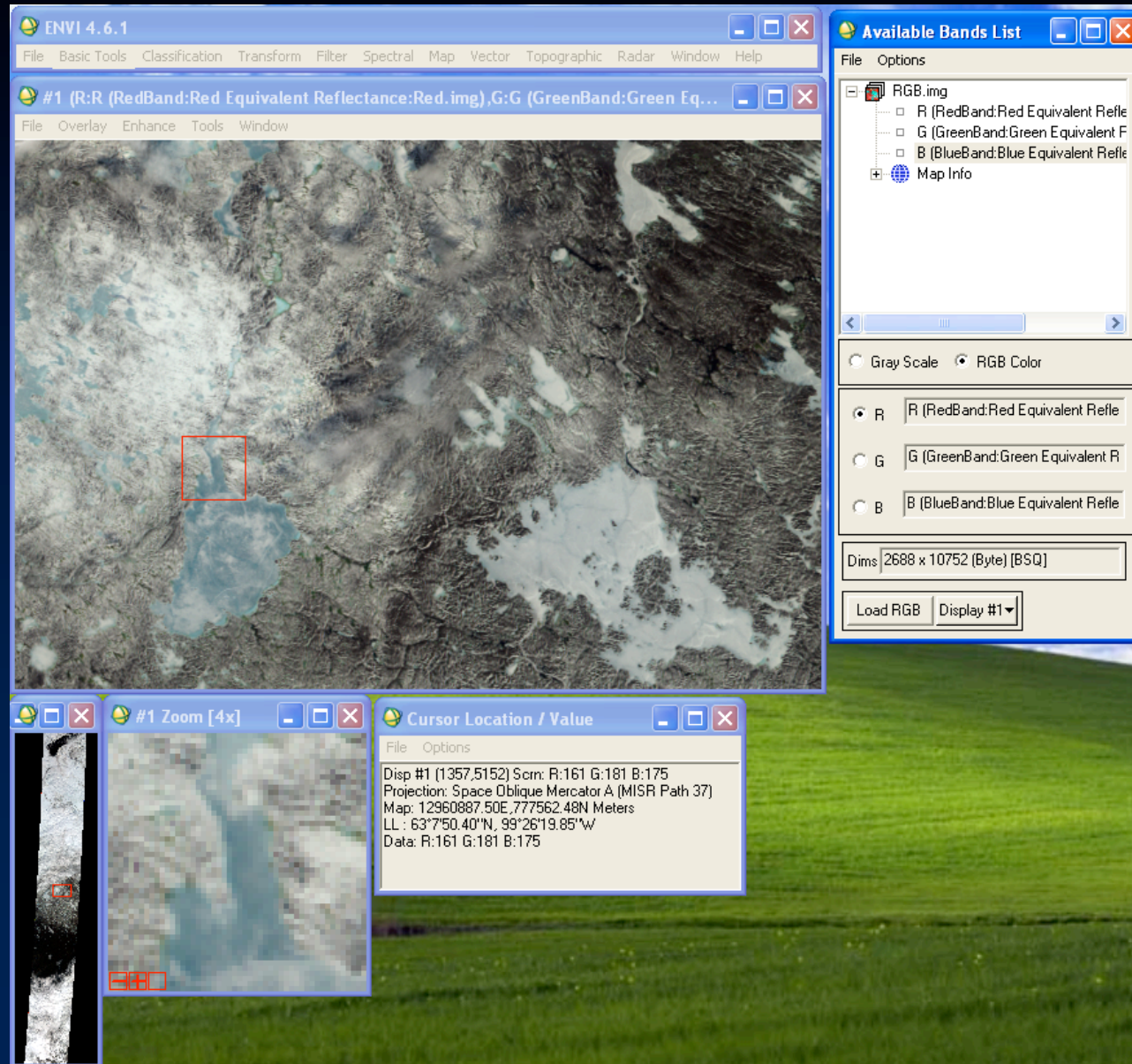
status = mtk_readdata(filename, gridname, fieldname, region, databuf, mapinfo)
if (status ne 0) then exit

status = mtk_write_envi_file(envifilename, databuf, mapinfo, filename, gridname, fieldname)
if (status ne 0) then exit

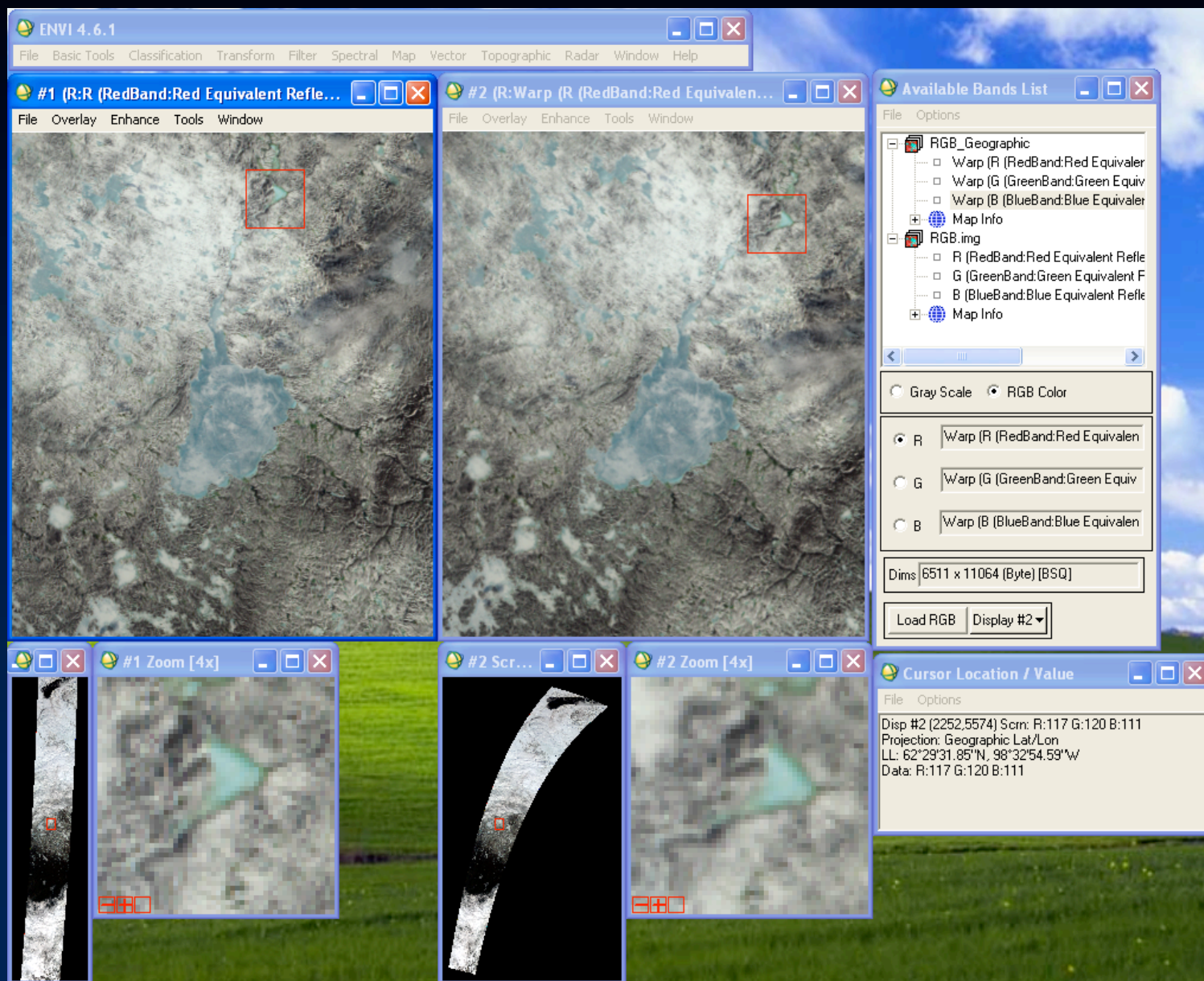
end
```



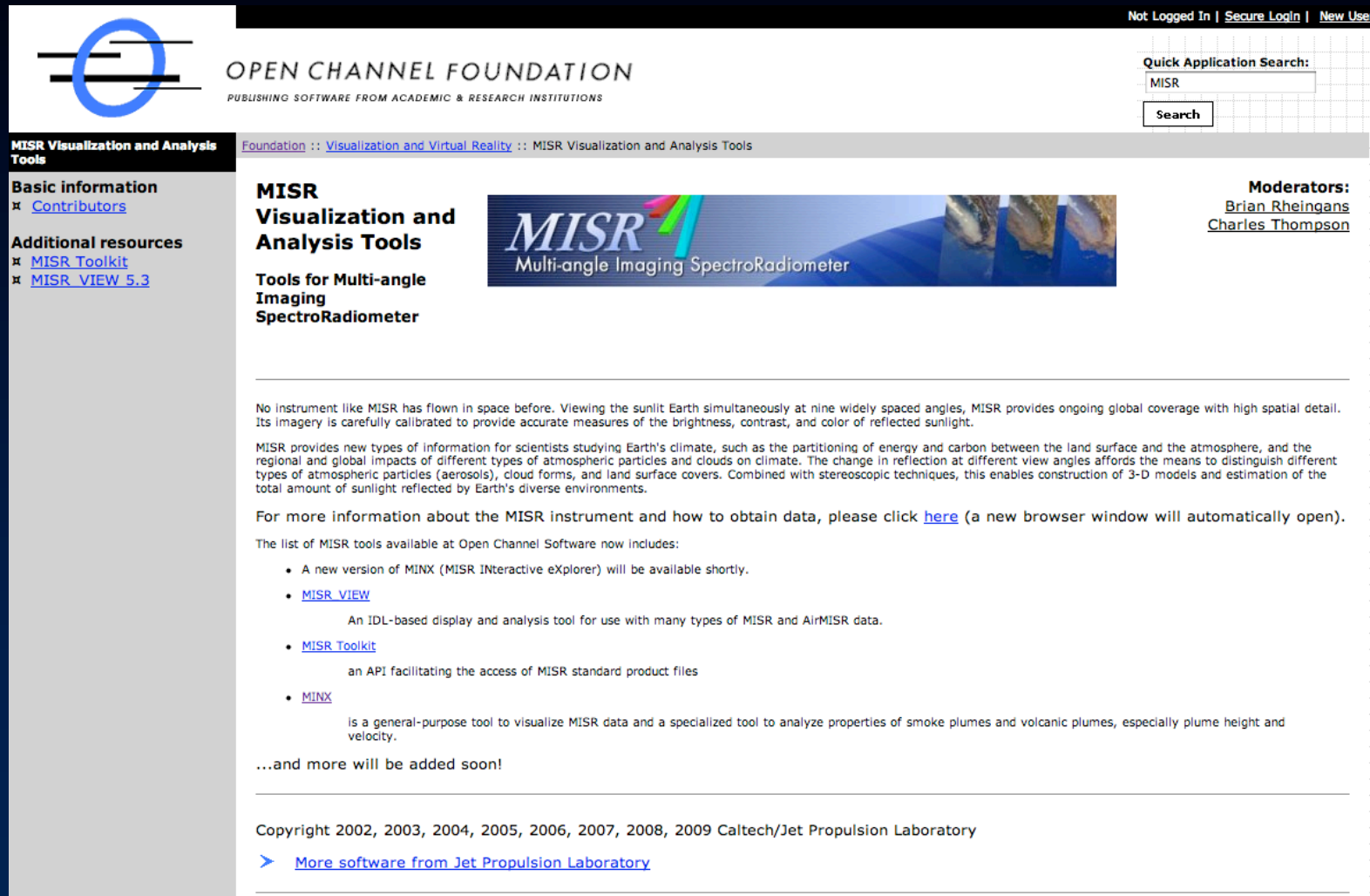
# MISR data loaded in ENVI preserving geolocation information



# MISR SOM data reprojected to Geographic Lat/Lon using ENVI



# Where to get the MISRView, MISR Toolkit and MINX? Open Channel Foundation



The screenshot shows the Open Channel Foundation website. The header includes the logo, the text "OPEN CHANNEL FOUNDATION PUBLISHING SOFTWARE FROM ACADEMIC & RESEARCH INSTITUTIONS", and a search bar with "MISR" entered. The left sidebar contains links for "Basic information" (Contributors) and "Additional resources" (MISR Toolkit, MISR\_VIEW 5.3). The main content area is titled "MISR Visualization and Analysis Tools" and features a banner for the "MISR Multi-angle Imaging SpectroRadiometer". Below the banner, there is a paragraph about the instrument's capabilities, followed by a list of tools available: MINX (MISR Interactive eXplorer), MISR\_VIEW (an IDL-based display and analysis tool), MISR\_Toolkit (an API for accessing standard product files), and MINX (a general-purpose tool for visualizing MISR data and analyzing smoke and volcanic plumes). The footer includes copyright information for 2002-2009 Caltech/Jet Propulsion Laboratory and a link to "More software from Jet Propulsion Laboratory".

Not Logged In | [Secure Login](#) | [New User](#)

**OPEN CHANNEL FOUNDATION**  
PUBLISHING SOFTWARE FROM ACADEMIC & RESEARCH INSTITUTIONS

Quick Application Search:

**MISR Visualization and Analysis Tools**

Foundation :: [Visualization and Virtual Reality](#) :: MISR Visualization and Analysis Tools

**MISR Visualization and Analysis Tools**

**Tools for Multi-angle Imaging SpectroRadiometer**

**Moderators:**  
[Brian Rheingans](#)  
[Charles Thompson](#)

No instrument like MISR has flown in space before. Viewing the sunlit Earth simultaneously at nine widely spaced angles, MISR provides ongoing global coverage with high spatial detail. Its imagery is carefully calibrated to provide accurate measures of the brightness, contrast, and color of reflected sunlight.

MISR provides new types of information for scientists studying Earth's climate, such as the partitioning of energy and carbon between the land surface and the atmosphere, and the regional and global impacts of different types of atmospheric particles and clouds on climate. The change in reflection at different view angles affords the means to distinguish different types of atmospheric particles (aerosols), cloud forms, and land surface covers. Combined with stereoscopic techniques, this enables construction of 3-D models and estimation of the total amount of sunlight reflected by Earth's diverse environments.

For more information about the MISR instrument and how to obtain data, please click [here](#) (a new browser window will automatically open).

The list of MISR tools available at Open Channel Software now includes:

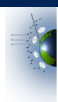
- A new version of MINX (MISR Interactive eXplorer) will be available shortly.
- [MISR\\_VIEW](#)  
An IDL-based display and analysis tool for use with many types of MISR and AirMISR data.
- [MISR\\_Toolkit](#)  
an API facilitating the access of MISR standard product files
- [MINX](#)  
is a general-purpose tool to visualize MISR data and a specialized tool to analyze properties of smoke plumes and volcanic plumes, especially plume height and velocity.

...and more will be added soon!

Copyright 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009 Caltech/Jet Propulsion Laboratory

> [More software from Jet Propulsion Laboratory](#)

<http://www.openchannelsoftware.org>  
Search for "MISR" in the Quick Applications Search field



Distributed by the Atmospheric Science Data Center  
<http://eosweb.larc.nasa.gov>



# Other Tools to access MISR data



## Tools for Working with MISR Data Products

Tool	Description	Data Products (definitions)	Data Format (definitions)	Software Language
<a href="#">Orbit/Date Conversion</a>	Interactive interface for converting dates to MISR Orbit number and Orbit numbers to dates	N/A	N/A	N/A
<a href="#">Lat/Lon to Path/Block Conversion</a>	Interactive interface for obtaining MISR paths based on latitude and longitude	L1, L2	N/A	N/A
<a href="#">MISR Browse Tool</a>	Easy access to ellipsoid projected true-color images for each camera reduced to 2.2 km resolution	Browse	N/A	N/A
<a href="#">MISR Interactive eXplorer (MINX)</a>	Interactive application for visualizing Level 1B2 data and for retrieving plume heights and wind velocities from wildfire smoke, volcanic and dust plumes	L1B2, GP_GMP and AGP required; TC_CLASSIFIERS and AS_AEROSOL recommended	Stacked-block	IDL, C
<a href="#">MISR Toolkit</a>	Simplified programming interface for Level 1B2, Level 2, and Ancillary products	L1B2, L2, Ancillary	Stacked-block, Conventional	Various
<a href="#">misr_view</a>	Visualizes MISR TOA radiances, aerosol, surface, and cloud data products	L1B2, L2	Stacked-block	IDL, IDLVM
<a href="#">IDL Utilities</a>	Routines for extracting data and metadata from Level 1B2, Level 2, and Level 3 products	L1B2, L2, L3	Stacked-block, HDF-EOS Grid (L3 only)	IDL
<a href="#">ENVI Tool</a>	Geolocates and visualizes MISR TOA radiance, Terrain and Ellipsoid projected products and the Level 2 Land BRF parameter	L1B2, L2 (BRF only)	Stacked-block	ENVI
<a href="#">ENVI SOM Instructions</a>	Instructions for setting Space Oblique Mercator map information in ENVI version 4.0	L1B2, L2	Conventional	ENVI
<a href="#">misr_time</a>	Calculates the block center times for MISR Level 1B2 files	L1B2	Stacked-block	IDL, IDLVM
<a href="#">hdfscan</a>	Visualize and explore MISR data products	L1B2, L2, L3	Stacked-block, HDF-EOS Grid (L3 only)	Multiple
<a href="#">HDFView and HDF-EOS plug-in</a>	Tool for browsing and editing NCSA HDF4 and HDF5 files	L1B2, L2, L3	Stacked-block, Conventional, HDF-EOS Grid (L3 only)	Various
<a href="#">Conversion to ASCII</a>	Routines to write parameters from MISR Level 1B2 or AGP data files to a set of ASCII formatted files	L1B2, AGP	Stacked-block	IDL, IDLVM
<a href="#">MISR HDF-to-Binary Converter</a>	HDFDUMP extracts data from a HDF-EOS grid format file (Level 1B2 and Level 2 files) and writes unformatted binary files	L1B2, L2	Stacked-block	FORTRAN 90
<a href="#">Radiance/BRF Calculation Tools</a>	BRFDUMP calculates radiances and bidirectional reflectance factors (BRF) from Level 1B2 files and creates unformatted binary files	L1B2	Stacked-block	FORTRAN 90
<a href="#">HDF-EOS to GIS Format (HEG) Conversion Tool</a>	Reformat, re-project and perform stitching/mosaicing and subsetting operations on HDF-EOS objects	L1B2, L2	Stacked-block	Various
<a href="#">HDF Data Manipulation Software</a>	Applications to open a Hierarchical Data Format (HDF) file	N/A	N/A	Various
<a href="#">Unidata software for manipulating or displaying netCDF data</a>	References to software packages for manipulating or displaying netCDF data	L3	netCDF	Various

[http://eosweb.larc.nasa.gov/PRODOCS/misr/tools/misr\\_tools.html](http://eosweb.larc.nasa.gov/PRODOCS/misr/tools/misr_tools.html)



# MISR Multi-path Mosaic



Albers Conic Equal Area Projection  
Standard Parallels:  $29^{\circ} 30'$  and  $45^{\circ} 30'$   
Projection Center:  $36^{\circ}$  N and  $92^{\circ}$  W

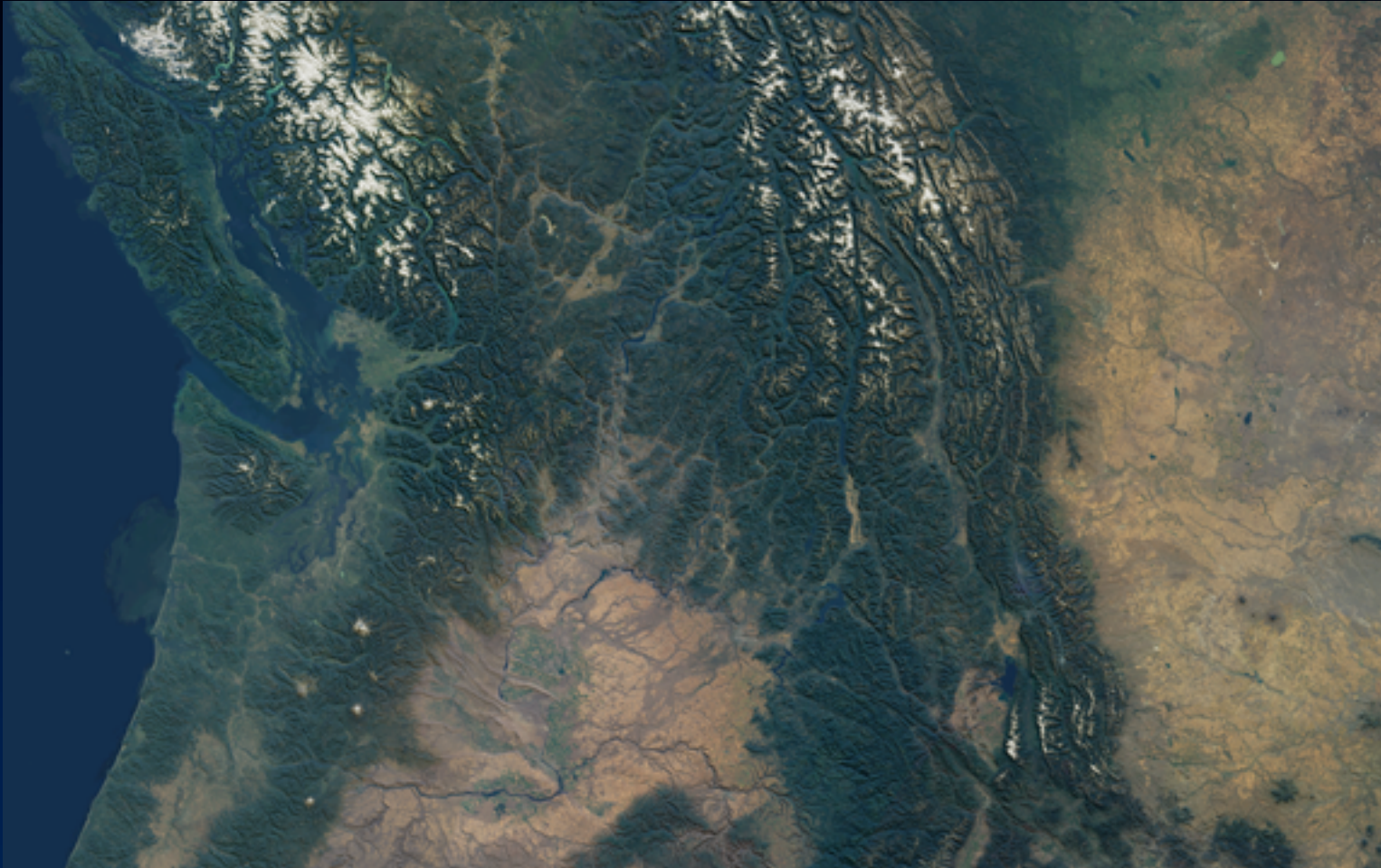
Image credit: NASA/GSFC/LaRC/JPL, MISR Team  
Multi-path mosaic by Jim Knighton of Clear Light Image Products ([jknighton@clear-light.com](mailto:jknighton@clear-light.com))



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<http://eosweb.larc.nasa.gov>



# MISR Multi-path Mosaic



**Albers Conic Equal Area Projection**  
**Standard Parallels: 29° 30' and 45° 30'**  
**Projection Center: 36° N and 92° W**

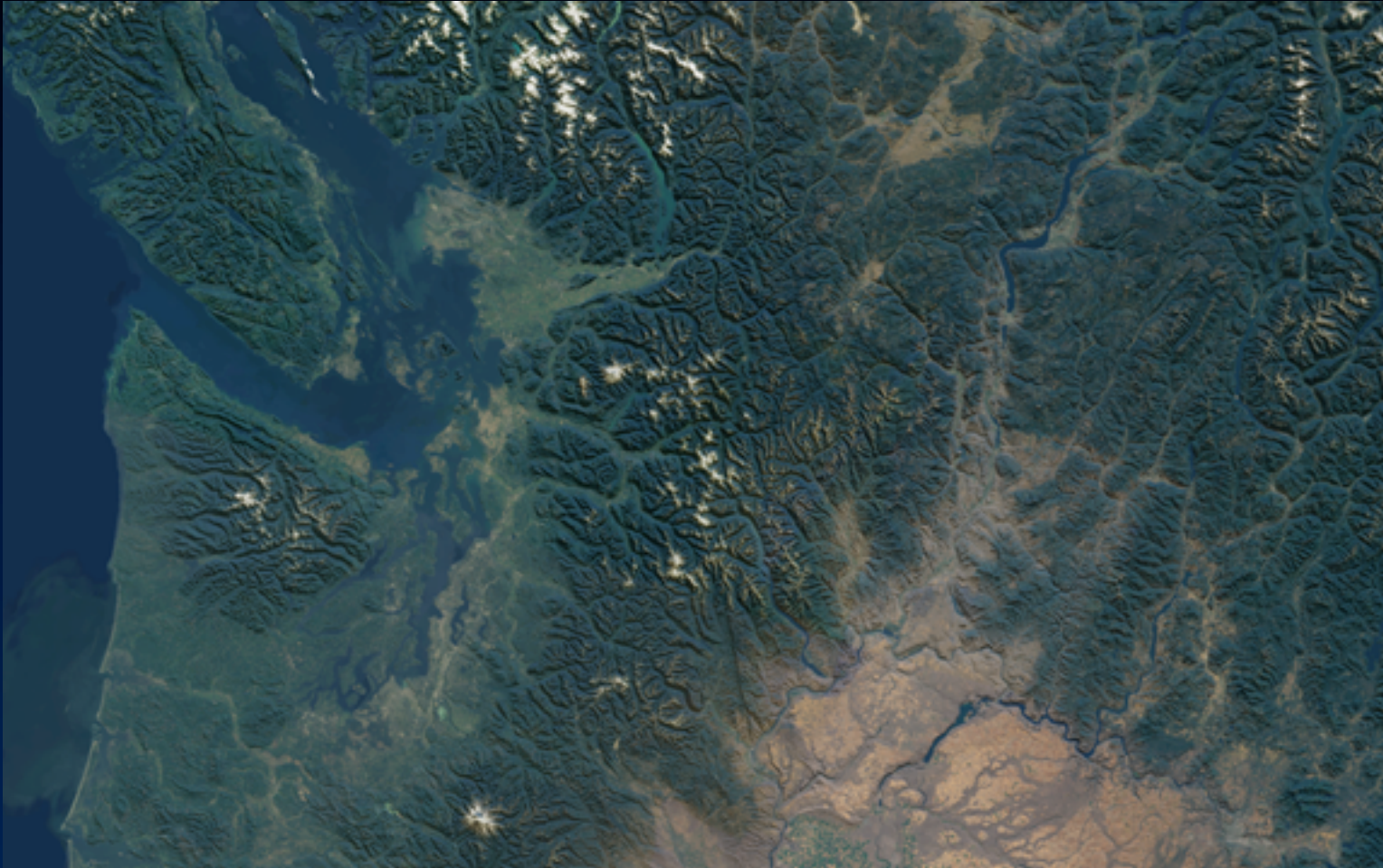
**Image credit: NASA/GSFC/LaRC/JPL, MISR Team**  
**Multi-path mosaic by Jim Knighton of Clear Light Image Products ([jknighton@clear-light.com](mailto:jknighton@clear-light.com))**



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**Albers Conic Equal Area Projection**  
**Standard Parallels: 29° 30' and 45° 30'**  
**Projection Center: 36° N and 92° W**

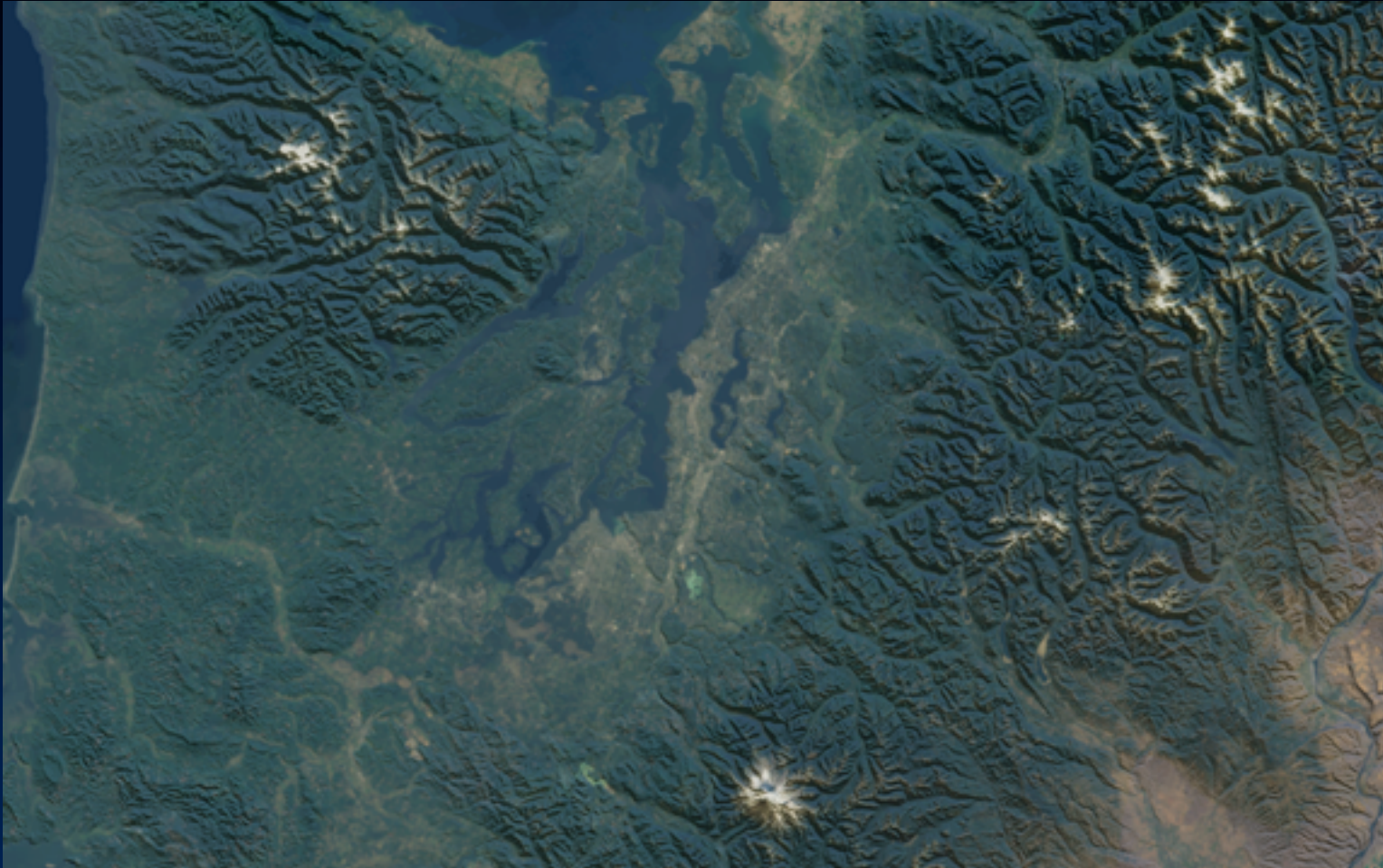
**Image credit: NASA/GSFC/LaRC/JPL, MISR Team**  
**Multi-path mosaic by Jim Knighton of Clear Light Image Products ([jknighton@clear-light.com](mailto:jknighton@clear-light.com))**



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Projection Center:  $36^{\circ}$  N and  $92^{\circ}$  W

Image credit: NASA/GSFC/LaRC/JPL, MISR Team  
Multi-path mosaic by Jim Knighton of Clear Light Image Products ([jknighton@clear-light.com](mailto:jknighton@clear-light.com))



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Image credit: NASA/GSFC/LaRC/JPL, MISR Team  
Multi-path mosaic by Jim Knighton of Clear Light Image Products ([jknighnton@clear-light.com](mailto:jknighnton@clear-light.com))



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